Space Environment Testbed Pre-NRA Workshop
Goddard Space Flight Center
January 25-26, 2001

The Living with a Star Program
Program Overview

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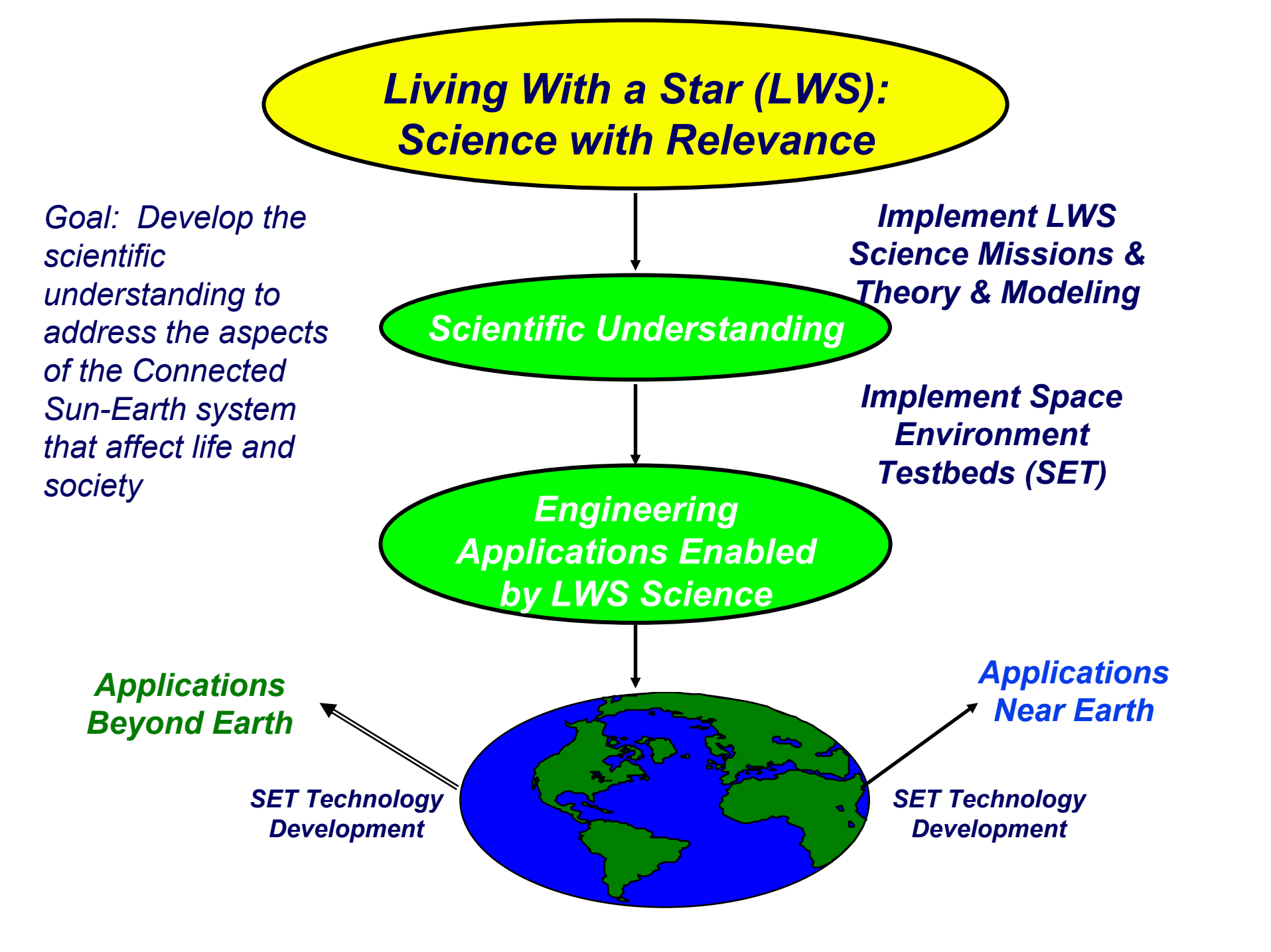
LWS Program Executive


Living With a Star (LWS):
Science with Relevance
Goal: Develop the scientific understanding to address the aspects of the Connected Sun-Earth system that affect life and society
Implement LWS Science Missions & Theory & Modeling
Scientific Understanding
Implement Space Environment Testbeds (SET)
Engineering Applications Enabled by LWS Science
Applications Beyond Earth
Applications Near Earth
SET Technology Development
SET Technology Development

The Sun & Earth Are a Connected System

Variable Star

Interacting

- ***Magnetic fields***
- ***Plasmas***
- ***Energetic particles***

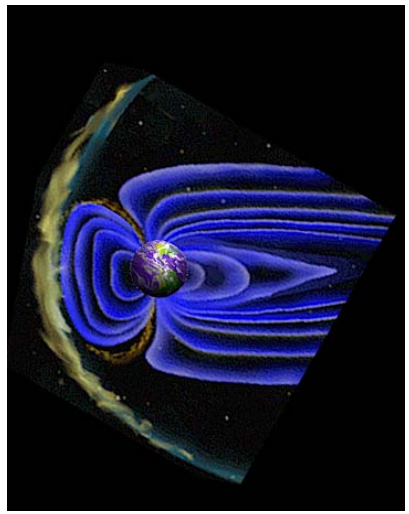
Varying

- ***Radiation***
- ***Solar wind***
- ***Energetic particles***

Interacting

- ***Solar wind***
- ***Energetic particles***

Earth



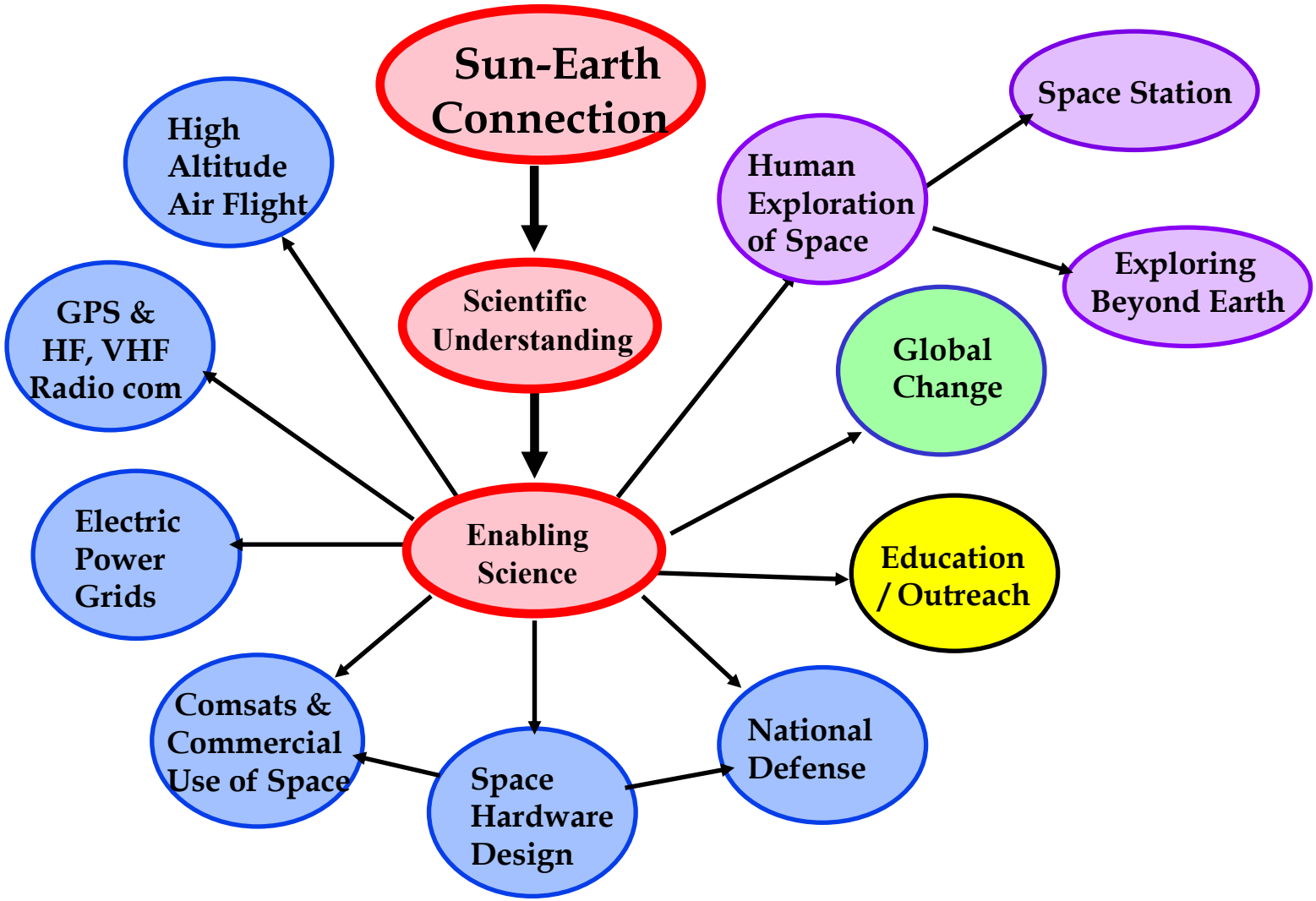
Interacting

- ***Magnetic fields***
- ***Atmosphere***
- ***Plasma***
- ***Energetic particles***

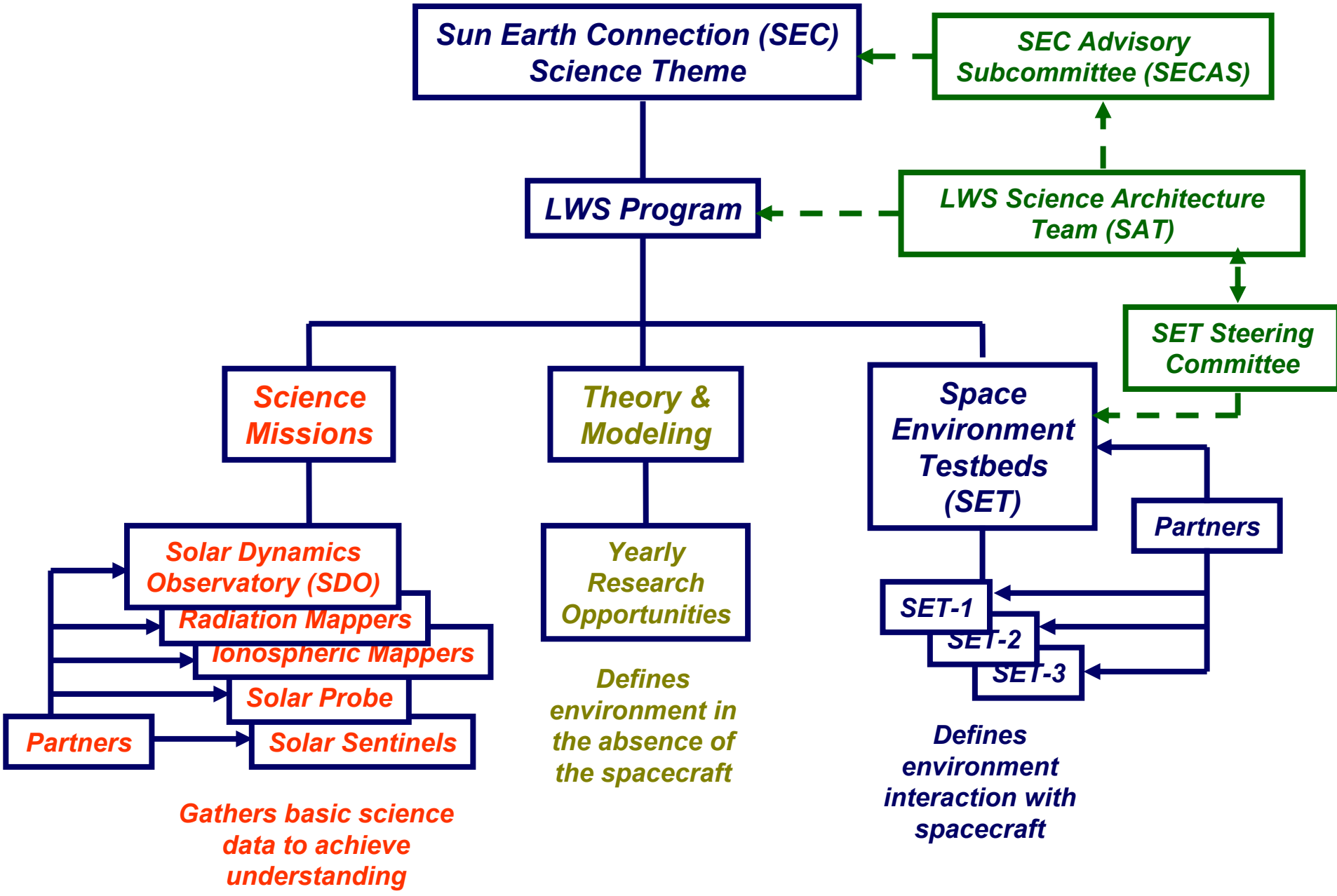
QUESTIONS:

- ***How and why does the Sun vary?***
- ***How do the Earth and planets respond?***
- ***What are the impacts on humanity?***

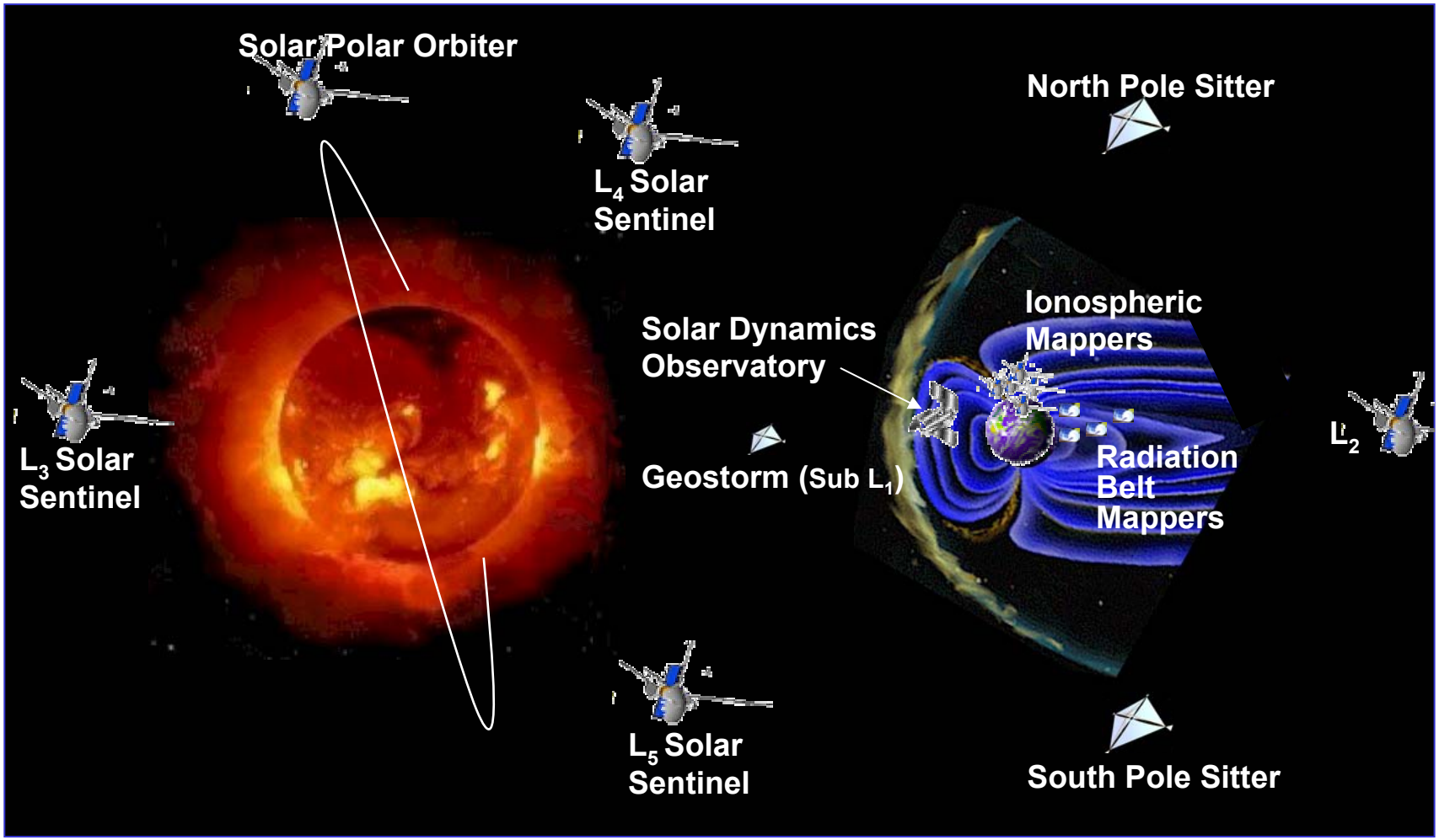
Sun Earth Connections



Living With a Star (LWS) Program Architecture



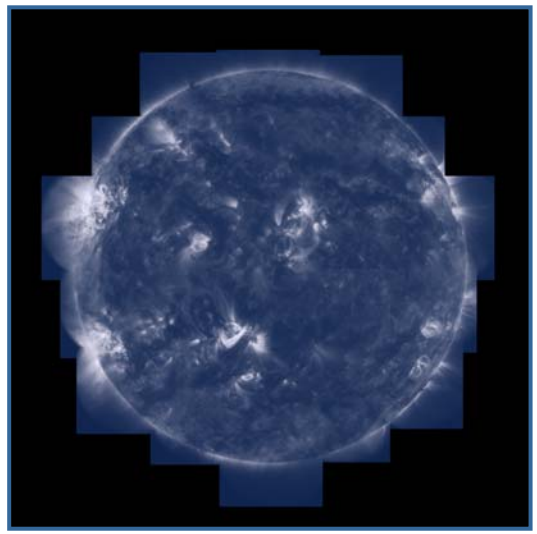
Living With a Star (LWS) Science Missions: A Network to Quantify the Sun-Earth Connected System



Living With a Star Theory & Modeling

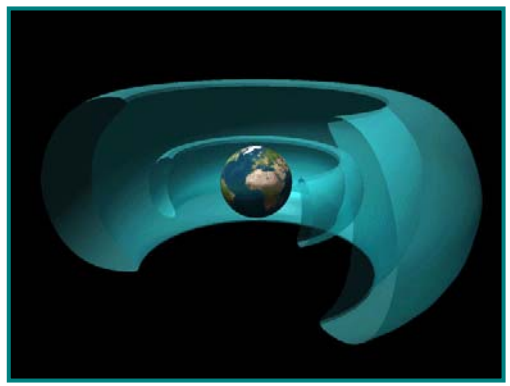
Objective

Perform research to refine the understanding of space weather & the role of solar variability in terrestrial climate change



Approach

- ***Improve understanding of space weather & solar variability***
- ***Improve understanding of solar variability & its effect on long term climate change***
- ***Perform research & development to enable improved environment specification models & predictive capability***



Scope

Solar atmosphere to Earth's ionosphere

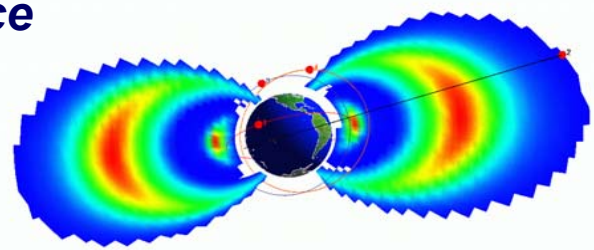
Living With a Star Space Environment Testbeds

Objective

Improve the engineering approach to accommodate and/or mitigate the effects of solar variability on spacecraft design & operations

Approach

- *Collect data in space to validate new & existing ground test protocols for the effects of solar variability on emerging technologies & components*
- *Develop & validate engineering environment prediction & specification models, tools, & databases*
- *Collect data in space to validate the performance of instruments for LWS science missions & new space technology*



Scope

Spacecraft hardware & design /operations tools whose performance changes with solar variability

Space Environment Testbed Products

Bridge the Gap Between Science, Engineering, & User Application Communities

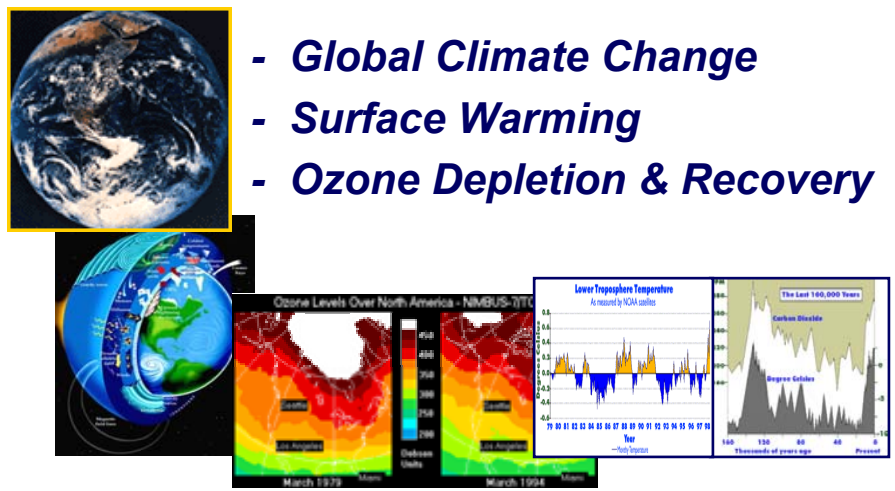
Human Radiation Exposure

- Space Station
- Space Exploration
- High Altitude Flight
- Space Utilization & Colonization

Impacts on Technology

- Space Systems
- Communication & Navigation
- Aircraft Systems
- Ground Systems

Impacts on Life & Society



- Global Climate Change
- Surface Warming
- Ozone Depletion & Recovery

LWS Pre-formulation Meetings

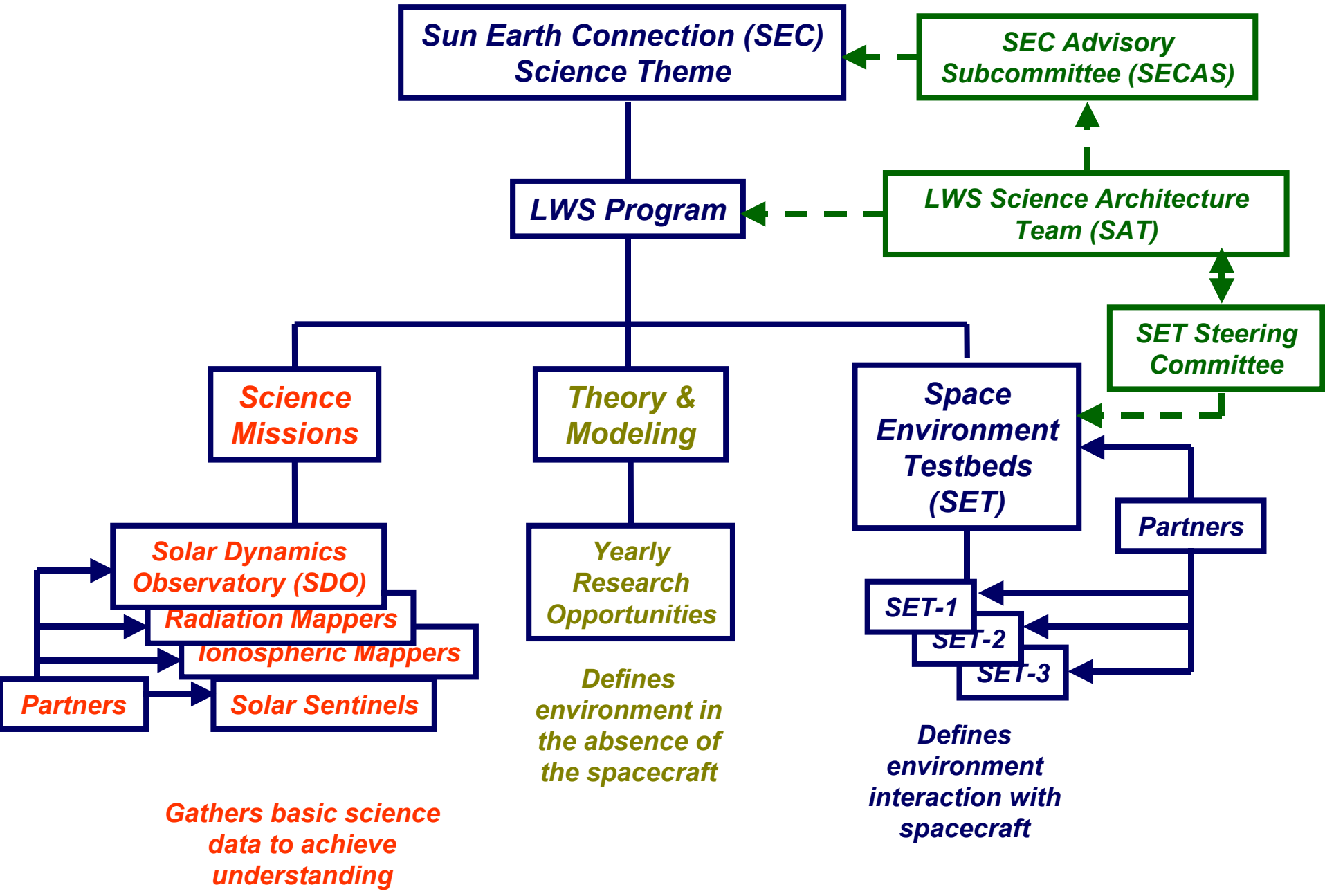
Partnerships are being developed within NASA, other agencies, and industry to define their priorities and stimulate synergism for space weather systems of the future. Some of the larger meetings held to date illustrate the importance given to developing these partnerships.

- ***NOAA Space Environment Center Visit November 9-10***
- ***NASA Headquarters LWS Inter-Agency Meeting January 11***
- ***SDO Preliminary Mission Definition Team Meeting January 24***
- ***LWS Measurement Requirements Workshop February 9-10***
- ***RBM Preliminary Mission Definition Team Meeting March 9***
- ***IM Preliminary Mission Definition Team Meeting March 16***
- ***Chapman Space Weather Conference March 20-24***
- ***AAS Goddard Memorial Symposium March 29-30***
- ***Sentinels Preliminary Mission Definition Team Meeting April 6***
- ***LWS Community Workshop May 10-12***

Program Status

- *LWS Funded Starting in FY01 as a continuous program*
- *Science Architecture Team (SAT) appointed by NASA/HQ*
  - *First meeting was in November 2000*
  - *SAT Workshop and Meeting in January 2001*
- *Solar Dynamics Observatory*
  - *Science Definition Team Formed*
  - *Launch Date – FY06*
- *NASA/HQ NRA in FY00 for Theory and Modeling*
- *Space Environment Testbed*
  - *Technology Provider Workshop in August 2000*
  - *Pre-NASA Research Announcement Workshop on January 25-26, 2001*
  - *NRA Announcement in February/March 2001*
  - *Targeted Launch Date – Late FY03, Early FY04*

Living With a Star (LWS) Program Architecture



Space Environment Testbeds (SET) Advisory Structure

SET Steering Committee

Chair: Janet Barth, GSFC
Co-Chair: Kenneth LaBel, GSFC

Spacecraft Charging Working Group
Chair: Dale Ferguson, GRC
Co-Chair: Robb Frederickson, JPL

Detectors Working Group
Chair: Cheryl Marshall, GSFC
Co-Chair: Tom Grycewicz, AF/DTRA

Materials Working Group
Chair: John Connell - LaRC
Co-Chair: David Edwards, MSFC

Microelectronics Working Group
Chair: Sammy Kayali, JPL
Co-Chair: Tom Turflinger, NAVSEA/CRANE

Collateral Environment Measurements Experiment Support
Chair: Don Brautigam, AFRL/Hanscom
Co-Chair: James Kinnison, JHU APL

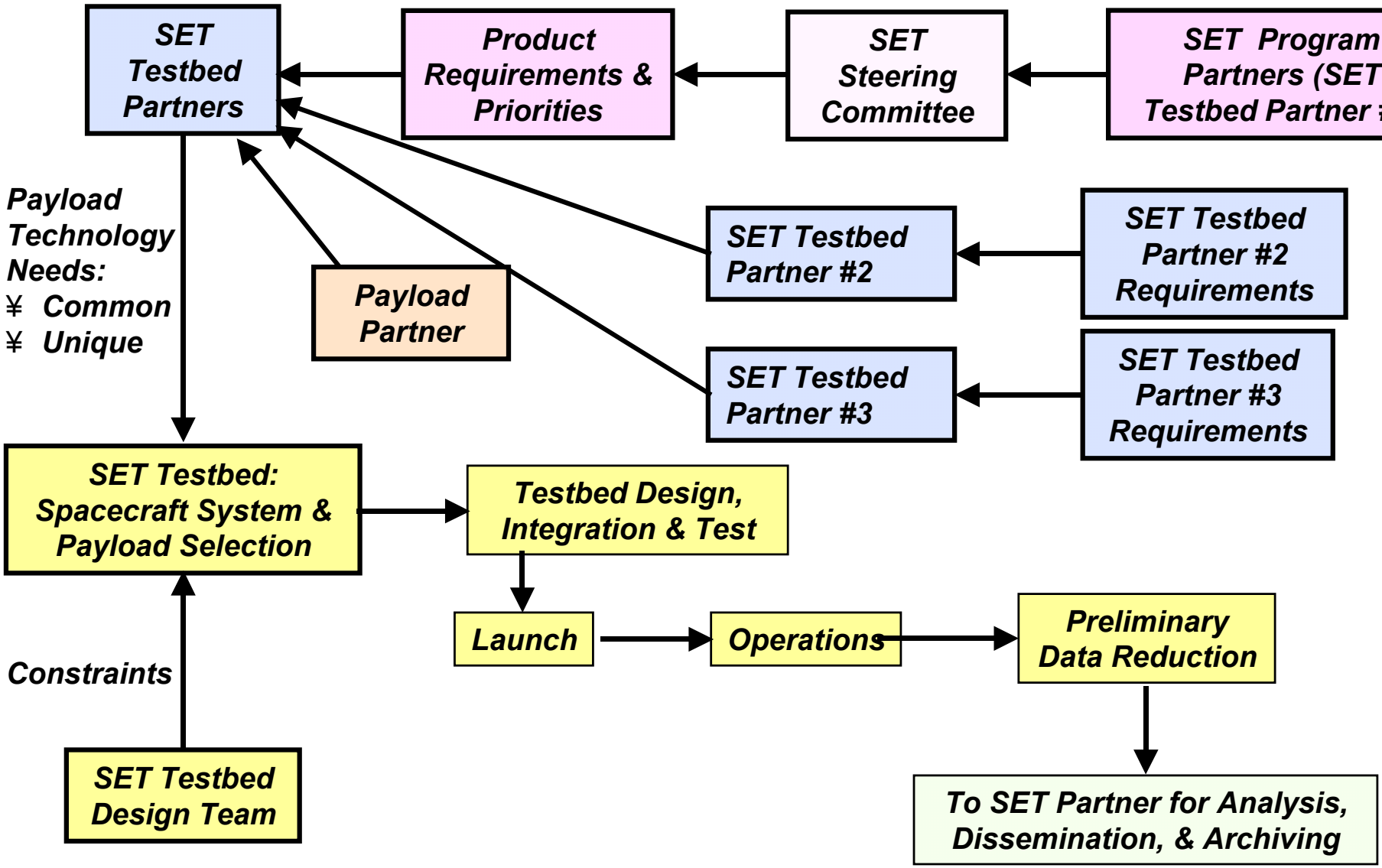
Steering Committee Functions:

- Represent organizationÕs integrated set of technology needs
- Prioritize technical importance of tasks across all areas in response to (customer) needs
- Coordinate with technology developers & other technology customers

Technology Working Group Functions:

- Provide expertise as technology providers
- Develop candidate tasks for the LWS SET & prioritize them
- Review & coordinate technical products& issues with other technical providers

Space Environments Testbed Partnering Process



Three Options for Partnering

- ***SET Program Partners: Partners contribute to the success of the LWS/SET Program***
  - *Agree on objectives and requirements*
  - *Participate in all Program aspects*
- ***SET Project Partners: Partners contribute to the success of the Carrier***
  - *Retain separate requirements & objectives*
  - *Obtain allocation of spacecraft resources to achieve objectives*
- ***Payload Partners: Partners contribute ÒpayloadsÓin exchange for on-orbit operation, launch, & data return***
  - *ÒPayloadÓincludes ground test data if appropriate, on-orbit data after reduction, & funding for integration and on-orbit operations*
    - ***Variations in definitions of ÒpayloadsÓare negotiable; ÒfundingÓ can include in kind exchanges***

Establishment of Requirements

- *At this workshop –*
  - *Provide LWS/SET background information*
  - *Develop & prioritize requirements for SET tasks*
    - *Requirements form the basis for a NASA Research Announcement (NRA)*
    - *5 categories of requirements*
      - *Sensors/detectors*
      - *Materials*
      - *Spacecraft Charging*
      - *Microelectronics*
      - *Collateral (Correlative) Environments Measurements*
  - *Separate meetings available*

Points of Contact for Partnering

- Sign-up sheet is available for private meetings
- Dana Brewer – NASA/HQ
  - 202-358-1678
  - dbrewer@hq.nasa.gov
- Janet Barth – NASA/GSFC
  - 301-286-8046
  - JLBARTH@pop700.gsfc.nasa.gov
- Ken LaBel – NASA/GSFC
  - 301-286-9936
  - ken.label@gsfc.nasa.gov